

A STUDY ON ECONOMIC ANALYSIS OF SCM IN CONSTRUCTION INDUSTRY IN CHENNAI

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ARTICLE INFO

Article History:

Received: 17 Jun 2016;
Received in revised form:
25 Jun 2016;
Accepted: 25 Jun 2016;
Published online: 30 Jun 2016.

Key words:

SCM, .
Supply Chain Management,
Supply Chain Framework,
Construction Industry

ABSTRACT

The present study made an attempt to identify supply chain frame work in Construction Industry. 50 samples were selected randomly from Chennai, Tamil Nadu. Based on the objectives certain hypotheses were formulated. Statistical tools such as One Way Analysis of Variance (ANOVA) and Correlation method was used to analyses the data. Questionnaire and interview method was used to collect the necessary data. Results found that there is a significant difference in their supply chain frame work based on type of firms. Also the result proved that there is a significant and positive relationship between the various factors such as investment level, modern communication, etc., and supply chain frame work in construction industry.

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INTRODUCTION

Construction is different from other industries because of at least following three reasons one-of-a-kind nature of projects, site production, and temporary organization. In spite of above fact, many efforts have been done to translate good practices from other industries especially from manufacturing to the construction industry. For last few decades, the researchers and people within the construction industry have moved towards different philosophies adopted in other industries in order to make construction industry more effective and more efficient. Supply Chain Management (SCM) is one of them. The main driver behind the adoption of this philosophy was the successes within other industry sectors. SCM can be defined as network of different organizations, linked upstream and downstream in a chain, aiming to produce quality and value in the services and products for the end consumers through integrated processes and activities.

How to cite this article: Sentamilselvan, K., & Delecta, P., (2016). "A Study on Economic Analysis of SCM in Construction Industry in Chennai". *International Journal of Advanced Scientific Research & Development (IJASRD)*, 03 (02/II), pp. 139 – 148.

1.1 Meaning of Supply Chain Framework

Here various definitions of Supply chain framework are being given:

“A supply chain is a network of supplier, manufacturing, assembly distribution and logistics facilities that perform the functions of procurement of materials, transformation of these material into intermediate and finished products and the distribution of these products to customers”

According to Professor Douglas M Lambert. “Supply Chain Management as the integration of business process from the end user through original supplier who provide products, services and information that adds value for the customers”

According to Ganeshan & Harrison “A supply chain is a network of facilities and distribution options that perform the function of procurement of material transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers”

1.2 Objectives of Supply Chain Framework

Following are the some of the objectives of Supply chain frame work. They are: (1). Service Orientation; (2). System Orientation; (3). Competitiveness and Efficiency; (4). Minimizing the Time; (5). Minimizing Work in Progress; (6). Improving Pipeline Visibility; (7). Improving visibility Demand; and (8). Improving Quality.

1) Service Orientation: It has been to provide superior customer service. It is all about the value that the customer gets, which in turn depends upon his own perception about what constitutes value.

2) System Orientation: It is at the existence of any supply chain. Synergy due to cooperation and coordination is the main gain of a supply chain.

3) Competitiveness and Efficiency: Supply chain is a business organization. It provides value to the customers while being competitive. Competitiveness is essential for it to healthy sustain itself in order to be able to provide increasing value to its customer. Efficiency is an important element of competitiveness.

4) Minimizing the time: Efficient supply chain is an organization reduces the time required for converting orders into cash. So there is minimal time lag and increase in productivity of the organization.

5) Minimizing Work in Progress: Supply chain minimizes total work in process in supply chain.

6) Improving Pipeline Visibility: Efficient supply chain improve the visibility of each one of the activities of the supply chain by each one of the partner.

7) Improving visibility Demand: Efficient supply chain improves visibility of demand by each one of the partners.

8) Improving Quality: Efficient supply chain management helps in improving the quality of operation of the organization. TQM has become a major commitment throughout all fact of industry. Overall commitment to TQM is one of the major commitment throughout all facets of industry.

1.3 Principles of Supply Chain Framework

It actually is concerned with more than the movement of materials from point to point. However, there are some principles attached to the use of supply chain management posited by Handfield and Niclois: These principles are described as follows:

- 1) The only entity that injects money into a supply chain is the end customer. That is until the client initiates a procurement process, the supply remains idle.
- 2) The solution that is stable over the long term is one in which every element of the supply chain, from raw materials to end customer, profits from the process. It is short sighted for business to believe they can solve their cost problems by punishing suppliers and customers. Shifting costs and problems without solving root causes is inherently unstable and mostly unsuccessful over the long term. The best supply chains will solve problems, implement the best solutions, and share the benefits among their members.
- 3) Supply chain management is about economic value added. Supply chain management is not just about cost reduction. It's about the total content of a final product or service, including quality, technology, delivery and after-sales service. Its about managing the total process and ultimately meeting the needs of the client. The integrated management of information and materials across the supply chain offers the benefits of increasing the value-added by supply chain members, removing waste, reducing cost and improving customer satisfaction.
- 4) The observation of construction project governance through the analysis of transactions classified broadly into information exchange, performance incentives and contractual relationships, provides benefits relation to clarity and quantification, particularly as procurement methods move away from the the traditional contracting system previously prevalent in the construction industry.
- 5) Therefore supply chain managers strive to achieve the ideas of fully integrated and effective supply chains, capable of creating and sustaining competitive advantage.
- 6) To this end they must balance downward cost pressures and need for efficiency, with effective means to manage the demands of market-driven service needs and the known risks of routine supply chain failures.

1.4 Characteristics of Supply Chain Framework

Construction supply chain involves stakeholders who are individual service providers such as subcontractors, designers, engineering consultants, transporters etc. and manufacturers of materials and equipments. On an average material cost contributes 50% to the project cost and hundreds of material and equipment suppliers take part in the supply chain. Apart from these suppliers, activities of the construction projects are subcontracted to specialty contractors such as designers, electrical, engineering, plumbing etc. Being a demand driven industry owner's involvement in the project remains crucial and continuous information flow from client is essential. Construction can be viewed as a complex of manufacturing and services. In this sense, many of the operations involved in manufacturing have similarity with construction projects in their characteristics. As an example, procuring materials and assembling them to make a product is common in both manufacturing and construction. This is the reason why Toyota, the leading Japanese auto manufacturer, has entered into housing construction and applying mass production and lean manufacturing techniques there.

1.5 Benefits of Supply chain frame work in Construction industry

Following are the benefits of effective SCM:

- 1) Transparency, trust and efficiency in the management of the supply chain present benefits to all parties involved in project delivery.
- 2) Clients can develop improved ability to identify strengths, weaknesses, opportunities and threats in the chain and increased value for money and efficiency.
- 3) Contractors can access improved early and continuous communications with clients and stakeholders and a more competitive subcontractor base offering better skills, expertise, innovation and value for money
- 4) Subcontractors can engender improved communication with contractors and assurance of continuity in business.

1.6 Process of Supply Chain Framework

Supply Chain Management - when you put the words together, a vague definition emerges, but the reality of this business process is far more complicated than it seems. According to Six Sigma Online, managing an effective and reliable supply chain solution essentially involves five key steps.

The first stage, planning, is fairly self-explanatory. Company executives and managers develop strategies to manage resources for timely product delivery. Metrics should be developed to monitor progress and compliance.

Choosing your suppliers is the next step. Managers are responsible for developing a system for pricing, delivery and payment. Then there's manufacturing - the third phase.

"During this step, the manager schedules activities necessary for production, testing, packaging and preparation for delivery of goods or services to customers," the source explains. "The manufacturing process is very intense; worker productivity, level of quality and product output are monitored at this stage."

Delivery is the fourth stage of supply chain management. Managers coordinate order receipts, develop a network of warehouses and choose their carriers.

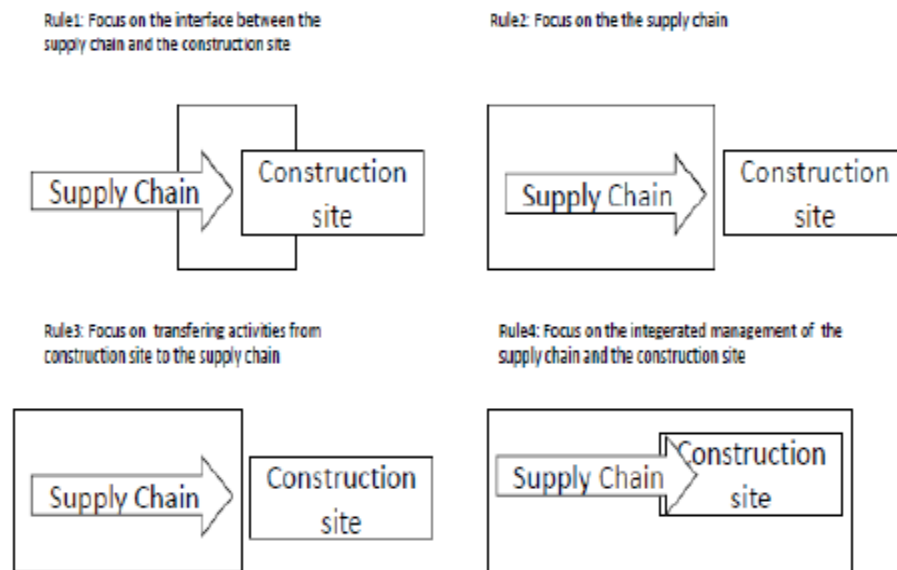
Finally, there is the defect and excess stage, which is likely the most difficult to handle effectively. Here, managers need to review their system of supporting customers who have problems with product delivery.

1.7 The Role of Supply Chain Framework

The manufacturing industry is the pioneer industry which introduces the concept of SCM as a new and important tool to perform the business process in a systematic and well defined way to save time, enhance quality and realize profit Tan, (2001). The construction industry SCM processes are scattered and are partially adopted. The building and construction industry can be divided into three main categories: building construction; heavy engineering construction and trade construction. While building construction can be further divided into residential and non-residential for example commercial and industrial building. Akintoye et.al. (2000) conducted a survey on supply chain management in UK construction industry and they argue that there exists partnership relationship among contractors, suppliers and clients; they only focus on the production planning and purchasing factors for the SCM process in construction industry and lists the barriers which can hindrance the successful process of SCM in construction industry. Vrijhoef and Koskela (2000) discussed four roles of supply chain management as described in the fig. 1. These four roles in construction industry can be recognized based on the focus of the industry

either construction site or supply chain or even both. The authors claimed these roles have major impact on the construction industry.

Fig 1: *Four Role SCM in Construction Industry*

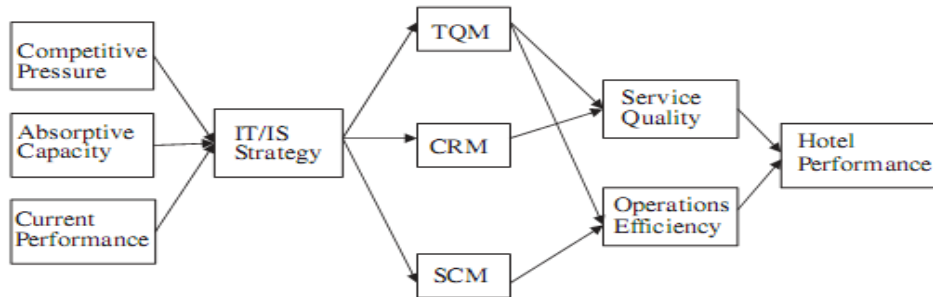


For example rule 1 focus on the interface between the supply chain and the construction site, the main impact of this is to reduce the costs and duration of site activities. These four roles does not seems to be mutually exclusive, while in practice these four roles are simultaneously applied to the supply chains in order to improve the efficiency of SCM processes. Welling and Kamann (2001) suggest that building and construction industry supply chains can be at firm level or project level. The firm level can provide stable and long term supply chains on the other hand project level supply chain are mostly temporary because their durations are already fixed. Love et.al (2002) identified the partnership relationship related to the alliances, which can be either strategic or project based. The project based alliances are more towards short term alliances for the temporary projects while the strategic alliances focuses on the long term partnership relationship for the large projects and the alliance is based on more than one project. Hence the partnership relationship plays vital role in building and construction industry which develops the trust and commitment.

Saboni e.al. (2007) and El-Saboni e.al.(2009) investigates the success of the construction projects in UAE are based on modern electronic communication management system. They provide a state of art on the usage of modern communication technologies in construction industry and also they investigate how these modern system influence the relationship of different project team members. Ali.et.al. (2010) studies the performance of construction projects in Malaysia; their research is based on quantitative data collection and through questionnaire surveys. In addition, they argue that Malaysian industry is still infancy to adopt the partnering approach their partnering approach is still local based this may be due to the influence of the culture. Soemardi et.al.(2007) explains the application of SCM in the Indonesian construction industry. They argue that the SCM processes in Indonesian construction industry are still in infancy or the SCM processes are not adopted at all. However their study is starting points towards the application of SCM in Indonesian construction industry, there still need more research in this area. Barkhi and

Daghfous (2009) study shows the application of TQM, SCM and CRM implementations in the UAE hotels. UAE also attracts tourist in the, with increase of tourist in the UAE, hotel managements four to five star category hotels have realized the benefits of the supply chain management. This case is a unique case and has relevance to the application of SCM in a UAE industry.

Fig 2: *Antecedents and Consequence of TQM, CRM and SCM Implementation*



1.8 Review of Literature

Albaloushi, Helal and Skitmore, Martin (2008) aim of the study Supply Chain Management (SCM) aims to improve trust and collaboration among supply chain partners, thus improving inventory visibility and velocity, and is an innovation that seems to be especially appropriate for construction projects. As in mainstream management, construction management ideas on supply chains have been evolving with corresponding influences from the theory of production, distribution, and strategic procurement, but there has been little significant research on the extent to which the construction industry is merging the supply chains and industrial organisation fields. In particular, the industry's awareness of both the concept of supply chain integration and its methods are relatively unknown, particularly in countries such as the United Arab Emirates (UAE).

Eric N. Ntabe (2014) conducted study on a systematic literature review of the supply chain operations reference(scor) model application with special attention to environmental issues. Present day concerns with climate change have imposed the consideration of green practices as a competitive requisite for supply chains. Consequently, it is increasingly mandatory for business organisations to make a transition toward integrating environmental performance as a constituent element for success. With its Green SCOR component, the SCOR model, which is a diagnostic tool for supply chains, can serve as a strategic tool for such environmental performance. However, evidence of environmental considerations in the application of the model within an array of industries in the last decade has not been investigated. This article uses a number of SCOR assessment criteria and elements to review selected SCOR model application papers, published between 2000 and 2012 with special attention to environmental criteria. Results indicate that although the innovative paradigm of moving from single firms to supply chain outfits has been embraced by business organisations, no paper experimented the model based on an end-to-end supply chain approach. While a generally timid interest in the model was observed, annual distribution of the articles shows a positive trend in the number of environment and return process related papers. 11.1% of the papers attempted the environmental dimension of the model while 24.4% attempted the return process. The study notes that while the SCOR model is suitable for supply chain financial performance evaluation, it is also a

practical decision support tool for environmental assessment and competing decision alternatives along the chain.

1.9 Challenges of Supply Chain Framework

In the competitive environment in the construction industry, it is critical for the contractor to focus all the energies in the efficient and effective execution of all the activities involved in construction. This effort requires the preparation of a plan to delineate the sequence of activities. Some of the resources needed to perform the activities include materials, equipment and labor.

Many challenges are encountered during the five phases of the materials management process.

1.10 Challenges –Information Technology

During the Bidding Phase, the GC may be forced to cut costs to satisfy budget limits of owners while still Committing to the same scope of work. The EC is usually one of the last trades to be procured in a project and many times is asked by the GC, prior to finalizing the sub-contract agreement, to absorb some of these cost reductions. The EC can provide to the owner expertise regarding materials and means and methods for installation, as well as more realistic cost estimates.

The Sourcing Phase requires access to data regarding prices, quality, delivery performances and existing contractual arrangements with manufactures and suppliers. Typically, prices are requested by a fax transmittal from the EC to the potential suppliers.

The Procurement Phase integrates individual orders, shipments and deliveries with the contractor's materials management plan. The person in charge of procuring material or the purchasing department in the case of a large company needs to ensure that the correct material in the correct quantities is ordered.

During the Construction Phase and the Post-Construction Phase tracking material is one of the biggest challenges faced by electrical contractor. Tracking allows for identifying what material is available, to minimize theft or loss, to identify where the material is stored on site and to control inventory costs.

1.11 Challenges – Decision Modeling

During the Bidding Phase various decisions need to be made regarding bidding and estimating the job. The first decision faced by the EC is the contract price to enter as bid. The quantity takeoff and estimate need to be completed in order to prepare and submit a bid package to the owner.

During the Sourcing Phase, the contractor has to decide entering into a blanket contract or a competitive bidding approach. Although guaranteed availability is insured through a blanket contract, better prices could be realized through a competitive bidding process.

Once the Procurement Phase is underway, the contractor needs to decide how much material is needed and when the material should be delivered to the site.

Once the construction phase has started, the decision of timing deliveries of material is based on a baseline project schedule indicating the amount of material needed at different times in the schedule as well as anticipated productivity and past difference.

The decision of where to deliver the material requires space planning and consideration of the site limitations, pre-fabrication strategies and subcontractors to be used. Material is generally requested for delivery to the job site.

Once the construction phase is completed, the decision of what to do with the surplus material depends on many factors such as availability of a warehouse and storage, expected need for the material in future projects, actual need for the material existing project, inventory holding costs, opportunity costs due to having capital invested in material that is being stocked, among other factors.

The EC needs to decide between sending the surplus to the supplier, selling the material to other contractors, sending the material to the warehouse or scrapping. The decision taken depends heavily on the tradeoffs between cost savings from making material readily available versus holding costs.

1.12 Challenges-Implementation Management

Changing procedures, installing and using new information technology and elevating managerial practices to the point where decision models are in everyday use has been known to be stressful to organizations that pursue such improvements. Better materials management practices and decision-making models could increase efficiency in operations and reduce overall costs.

RESEARCH METHODOLOGY

In this chapter, the methodology followed in conducting the research has been described. Details regarding the research design, data collection questionnaire, sampling plan, area of the study and statistical tools used have also been given. Finally the limitations of the study have also been briefed.

2.1 Research Design

Research design is purely and simply the framework or plan for a study that guides the collection and analysis of the data. The research design indicates the methods of research i.e., the method of gathering information and the method of sampling.

2.2 Sampling Plan

Sampling plan is to be decided about the sampling unit, sample size, sampling Method.

2.3 Sampling Method

For this study the samples were drawn using random sample method.

2.4 Sample Size

Sample size of the study that is selected from the sampling unit. Total estimated sample size is 50.

2.5 Objective of the Study

The main objective of the study is to find out attitude towards supply Chain Management in construction Industry based on type of firm. Further the secondary objective is to know the relationship between various factors and SCM.

2.6 Statistical Tools Applied

The following tools and techniques have been used for the analysis of the data. (i) One- way ANOVA and (ii) Correlation.

RESULTS AND DISCUSSION

Table – 1: *Correlation between Factors Influence and SCM*

SI No	Factors	SCM
1	Firm level	0.31*
2	Project level	0.53*
3	Investment cost	0.38*
4	Modern Communication System	0.47*

*Significant at 0.01 level

The above table shows the details about the relationship between the variables factors and SCM. Results reveals that the stated factors such as firm level, project level, investment level and modern communications system are positively and significantly related with SCM. But among the various factors such as project level and modern communication system

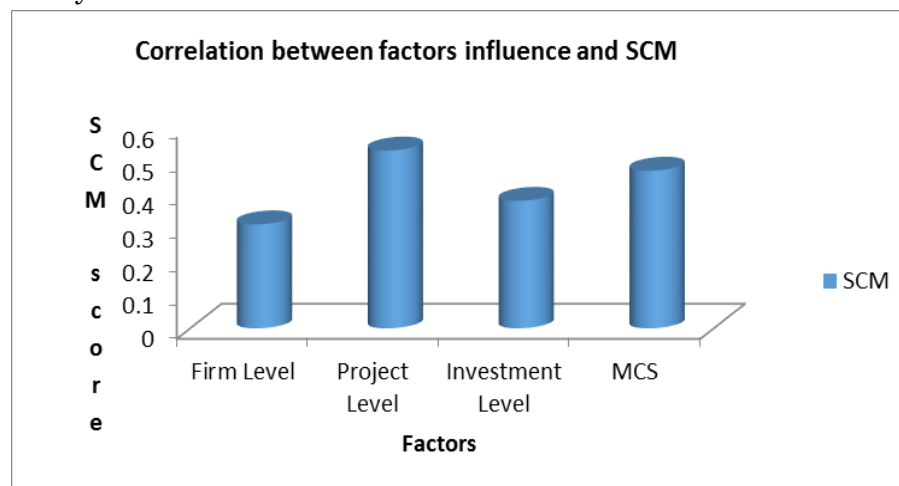
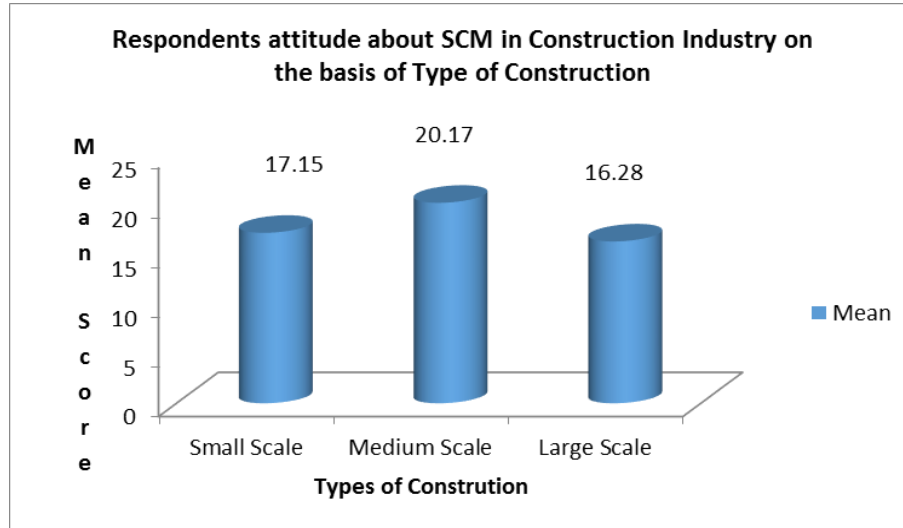


Table – 2: *Respondents Attitude about SCM in Construction Industry on the Basis of Type of Construction*

SI No	Type of Construction	N	Mean	S.D	P-value
1	Small Scale	25	17.15	1.21	0.05 significant
2	Medium Scale	15	20.17	1.63	
3	Large Scale	10	16.28	1.41	
	Total	50	53.6	1.68	

The above table observed the details shows respondents attitude about SCM in Construction Industry on the basis of type of construction. It is inferred that medium scale respondents have high level of attitude than the counter parts. The calculated p-value 0.05) which is significant. So the respondents differ in their level of attitude about SCM in construction Industry on the basis of type of firm.



CONCLUSION

The present study made an attempt to identify the factors and respondents attitude regarding the supply chain frame work in construction industry. Result concluded that respondents significantly differ in their attitude and also some factors such as firm level, project level, investment cost and Modern communication system are influenced.

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